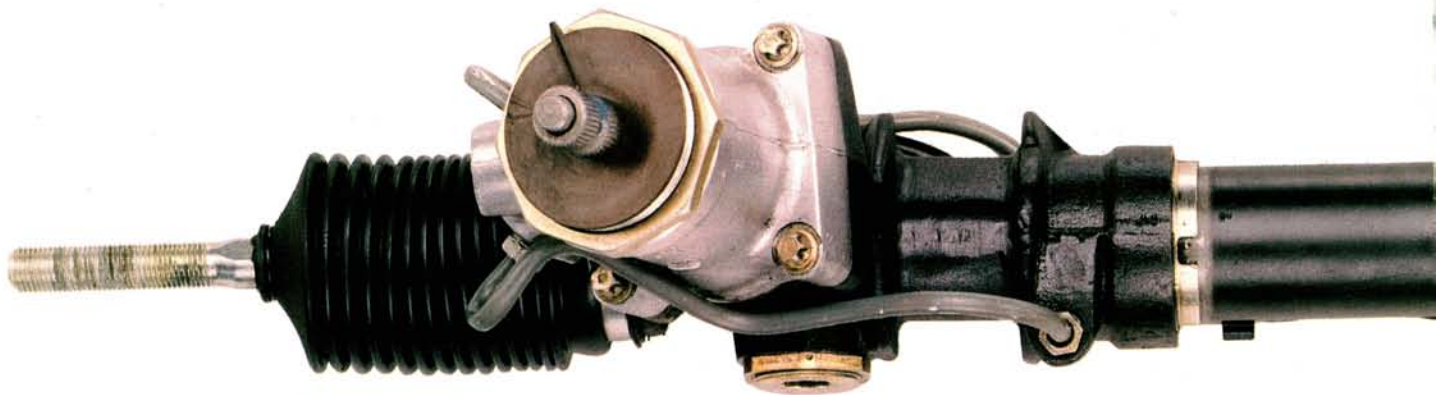


Nissan



Power Steering Rack

Power steering rack repairs aren't everyone's bowl of Cheerios. This might be an area that you've deliberately steered clear of until now. In spite of what you might think, rack repairs really aren't that difficult. Often, removing the unit from the car is the hardest part of the job. The question is whether you have the time, patience, and the special tools necessary to do the job properly.

Nissan has used several power steering rack designs over the years. Although they have their differences, most Nissan racks follow the same basic

design. Wear and leakage tend to occur in similar places, regardless of which model you're servicing.

It would be impossible to cover all of them in one article and do any of them justice. We're going to concentrate on a rack taken from a 1984 300ZX. Leakage problems have been common on these models over the years. The overhaul procedure we'll describe applies specifically to 1984-86 300ZXs. Because of their similarities, much of the information should help you with steering rack diagnosis and repair on other Nissan models as well.

Whether you use the information to help with an overhaul, or decide on a new or remanufactured unit is up to you. Either way, the owner probably won't bring the car to you until it gets difficult to steer or the pump is screaming because of fluid starvation. Before condemning the rack, here are several things to look at externally:

- Raise the car and check the rack carefully for the source of the leak.
- The outer dust boots are connected to each other by a breather tube. The tube equalizes pressure between

may be due to grooves or pitting on the pinion shaft. Any pinion shaft roughness will ruin a new seal quickly, causing a new leak. Pinion assemblies aren't available separately.

Steering rack seal kits, rack shafts, inner tubes, dust boots, and complete steering racks are available through Nissan parts departments for 300ZX rack repair. Check with your local dealer for current part numbers and prices.

Rack repair, overhaul, or replacement decisions should be made on an individual basis. It would be wrong to say that all racks can be rebuilt. Many can, but the cost and delay or inconvenience to the customer may make this alternative impractical.



the boots and keeps them from collapsing or swelling when the rack is turned from side to side.

- Power steering fluid can transfer between the boots through the breather tube. This makes it hard to determine which side the leak started on. Leaks more commonly start on the right end of the rack than the left.
- If the fluid leak is small, the boots can hide the leak from the owner since nothing drips on the ground.
- Larger leaks will fill the boots with fluid. Grab the boot on each side and give it a "squish test" to check for fluid leakage. Remove both boot clamps, then push the boots back to confirm your diagnosis.
- If enough fluid accumulates in the boots, the pressure will force fluid past the boot clamps. This will often be the first visible sign to the owner that he has a problem.
- The pinion seal at the top of the pinion shaft may also leak. This is often non-repairable because the leak

The unit may be in such poor condition that outright replacement with a new or remanufactured rack makes the most sense. Remanufacturers have the advantage of seeing what areas are causing problems, then adapting their remanufacturing procedures to correct them and prevent their recurrence. The remanufactured unit often includes upgrades not found in the O.E. unit.

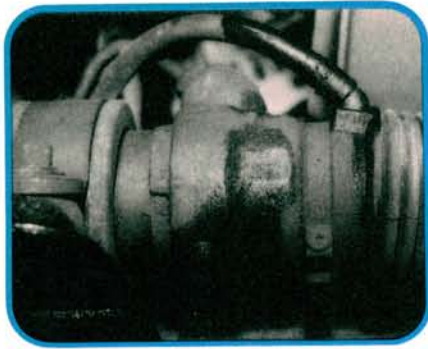
Several tools are essential for a successful 300ZX rack overhaul. We've listed them in chart form for your convenience. The overhaul photos make proper tool use self-explanatory. Safe alternatives to the special tools are also noted.

Our thanks to Crown Remanufacturing, Inc. for providing us with the 300ZX steering rack used in our overhaul sequence.

—By Karl Seyfert

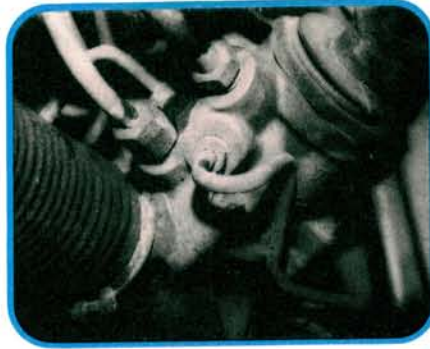
Special Tool Description	Kent Moore Tool Number	Usage
Rear housing lock nut wrench	J28818	Essential
Rear cover wrench	J28819	Essential
Cylinder lock nut wrench	J35995	Essential
Pinion torque adapter	J26364	Essential
Oil seal driver	J34264	Essential
Mainshaft nut wrench	J26348	Essential
Pinion seal installer	J28527	Recommended
Pinion bearing race remover	J25749-A	Recommended
Power steering stand	J28817	Recommended
Spring scale	J35999	Recommended

Rack repair tools are available from Kent Moore Tools. For more information circle number 220 on the reader service card.



1

Start by determining where the fluid leak is coming from. A rack on your bench will have a hard time telling you where it was leaking. External leaks may be caused by loose or cracked fittings and lines, porosity or cracks in the steering gear housing, or a damaged pinion shaft seal.



2

To pinpoint the source of an external leak, clean the rack thoroughly. Loosen, then tighten all line fittings to 20-26 Nm (14-20 ft-lb). Don't overdo it, the rear housing is only aluminum. Road test the car, then recheck for leaks. There's no sense removing the rack for an external leak.



3

A difficult leak to fix, either on or off the car, is one coming from the pinion seal area (arrow). Leaks in this area are usually caused by a corrosion damaged pinion shaft. The roughness on the shaft damages the pinion seals. New pinion assemblies aren't available separately.



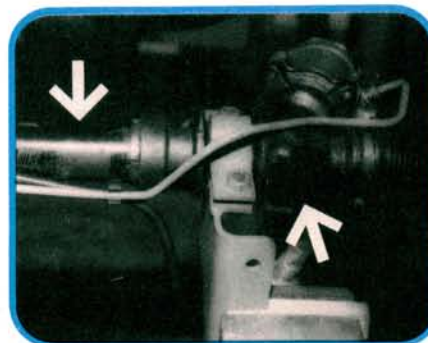
4

If the dust boots are full of fluid, you'll need to remove the rack whether you're rebuilding or replacing it. Prepare your customer for the worst before you start. Damage to other internal parts can make a rack overhaul either impossible or very expensive.



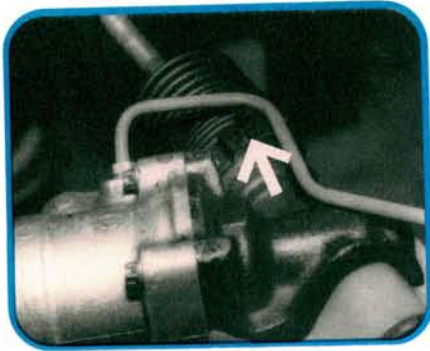
5

To remove the 300ZX rack, remove the short pressure line (arrow) between the pinion housing and the rear housing, the power steering pump feed and return lines, the tie rod ends, and the steering shaft pinch bolt. Remove the left and right rack mounting brackets (note locations), then remove the rack.

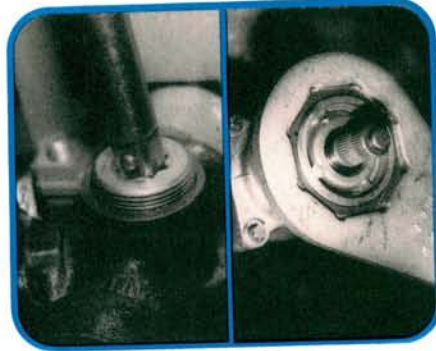


6

Mount the steering rack in a rack stand. Don't clamp the cylinder (left arrow) directly in a vise. Clamp the pinion housing (right arrow) in a vise equipped with soft jaws if you don't have the stand. Place a pan under the rack, then rotate the pinion several times to drain leftover fluid.

**7**

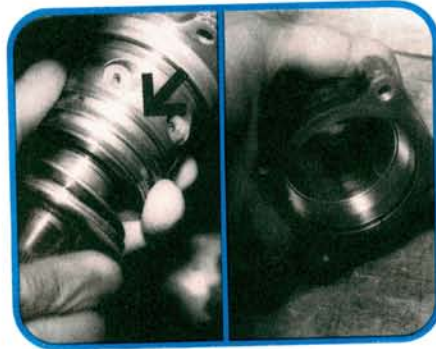
Carefully remove the dust boot breather hose clamps and both boot bands. The plastic nipples (arrow) on the boots break very easily. Turn the boots inside out. Scribe the right and left outer tie rod ends for position, then flatten the lock plates and remove the tie rod assemblies.

**8**

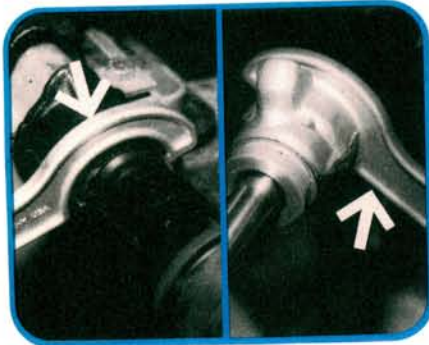
Remove the retainer adjusting screw lock nut. Use a half inch drive extension (left photo) to remove the retainer adjusting screw, spring, and retainer. Remove the plastic rear housing cover cap, then loosen and remove the rear housing lock nut (right photo) and cover.

**9**

Take a close look at the pinion shaft. Don't go any further if it's scored or pitted in the seal area. Remove the rear housing Torx® bolts with an 8 mm 12 point socket. To remove the rear housing, hold the pinion assembly in place while turning and lifting the rear housing.

**10**

Remove the pinion assembly, thrust washers, and needle bearing (left photo). Note the Teflon seal rings (arrow). Discoloration inside the rear housing (right photo) where the rings seat is normal. Any other damage to the rear housing or pinion means rack replacement. Neither part is available separately.

**11**

Loosen the pinion housing (left photo) and end housing (right photo) lock nuts with the special spanner (arrows). Rust can make it difficult to turn the lock nuts. You may need a small punch to get them turning. Remove the end housing and its bushing from the rack shaft.

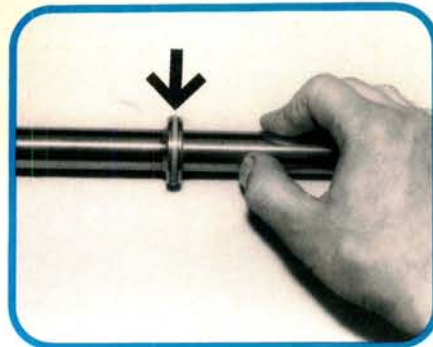
**12**

Remove the cylinder assembly (top), rack shaft (middle), and inner tube assembly (bottom), from the pinion housing. Separate the rack shaft from the cylinder assembly, then slide the inner tube off the rack. Discard the inner tube o-ring and set its nylon collar (arrow) aside.



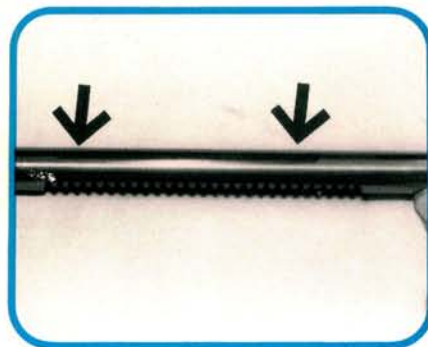
13

Remove the pinion housing oil seal with a large flat-bladed screwdriver. Take the pinion housing out of the rack stand, then wash it in clean solvent along with the other disassembled parts. Remove and discard all o-rings, oil seals, and both lock plates. Dry all parts with compressed air.



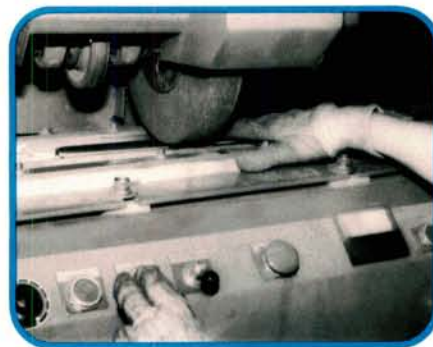
14

Examine the rack shaft under a strong light. It must be free of scratches, score marks, or corrosion pitting within seven inches on either side of the piston (arrow). Run your thumbnail in a spiral pattern along the shaft. Replace the shaft if you can catch your nail on any imperfections.



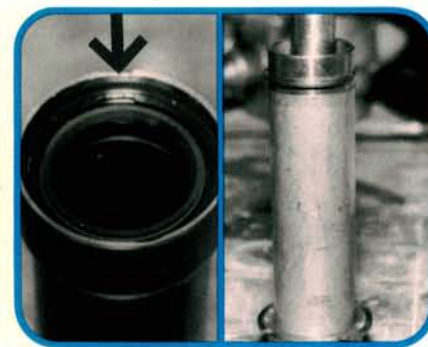
15

Discoloration of the rack shaft in the area opposite the rack teeth (arrows) is normal. This has no effect on the sealing ability or operation of the rack. Shafts showing heavy corrosion or roughness caused by dirt or water infiltration do require replacement, however.



16

Don't try this at home kids. Rack remanufacturers straighten and polish Nissan rack shafts to remove small scratches during their remanufacturing process. This specialized equipment produces a finish that's as smooth as a new shaft. Special rack seals compensate for the difference in shaft O.D.



17

This rack showed signs of a previous rebuild. Here's an example of how not to remove the inner tube oil seal (left photo). Never pry on the inner tube to remove its seal. Use a "suitable driver" or a socket and extension (right photo) to press out the inner tube seal and backup collar from behind.



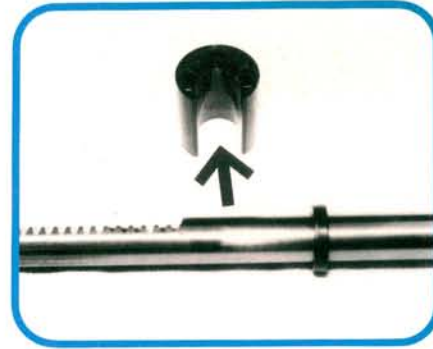
18

Replacement rack shafts are shipped with the inner tube and seal already installed. To reuse an old shaft, a new seal must be slid over the rack teeth without damage. Roll the Mylar sheet supplied with the seal kit into a tube, then insert it into the center of the seal. The ends of the sheet must overlap.



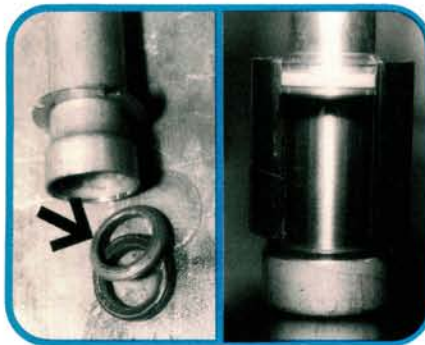
19

This is the only tricky part of the job. Slide the Mylar sheet and new seal over the rack teeth, keeping the seal in the middle of the sheet. The spring side of the seal must face the rack piston. Remove the sheet after the seal has cleared the teeth. Coat the outside of the oil seal with ATF.



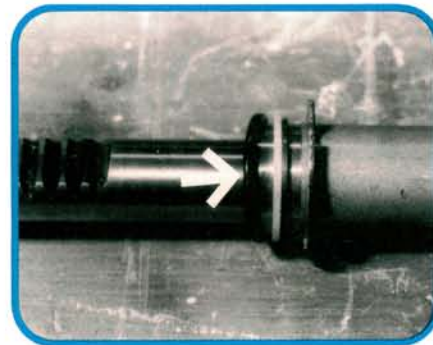
20

It's just about impossible to install the inner tube rack seal undamaged without this oil seal driver (arrow). Use care when assembling the parts before and during the next pressing operation to prevent damage to the rack shaft's surface. All it takes is a very small nick to cause a leak.



21

Seat the rounded shoulder of the backup collar (arrow left photo) inside the inner tube. Place the oil seal driver between the rack piston and the oil seal as shown (right photo). Slide the inner tube and the old end housing onto the rack. Press the rack shaft to install the new seal in the inner tube.



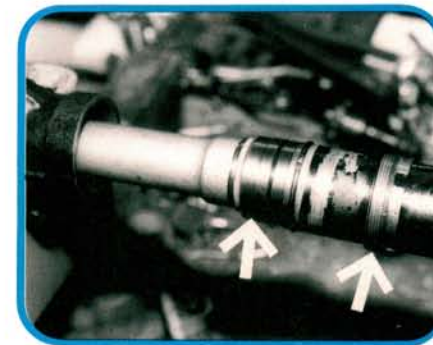
22

Remove the rack and inner tube assembly from the press. Remove the old end housing and seal driver from the rack. Install the nylon backup collar and a new o-ring (arrow) on the inner tube assembly. Reinstall the pinion housing in the power steering stand.



23

Coat the rack piston and the inner tube o-ring with ATF. Coat the rack teeth with grease, then slide the rack and inner tube into the pinion housing. Twist the inner tube assembly until it's fully seated in the pinion housing. Keep the rack shaft's teeth clear of the new rack seal.



24

Install two new o-rings on the cylinder assembly and coat them with ATF. Slide the cylinder over the rack shaft piston and into the pinion housing. The wide shouldered end (left arrow) of the cylinder assembly must face the pinion housing. Install the locknut (right arrow) and torque it to 78-108 Nm.



25

Wrap the sharp edges at the end of the rack shaft with cellophane tape. Coat the end housing oil seal with ATF, then install the rack bushing. Carefully slide the end housing and rack bushing onto the rack shaft. Tighten the cylinder locknut finger tight at this time. Remove the tape.



26

Coat the new pinion oil seal with ATF, then press it into place. The spring side of the seal must face away from the rack shaft. Use a "suitable driver" that contacts the outside edge of the seal if you aren't using the special tool. The right size socket with an extension will do the trick.



27

Wrap the pinion assembly splines with cellophane tape. Coat the pinion teeth and lower seal surface with grease. Coat the Teflon seal rings with ATF, then slide the pinion assembly into the pinion housing. Rotate the rack shaft until the rack teeth align with the teeth on the pinion assembly.



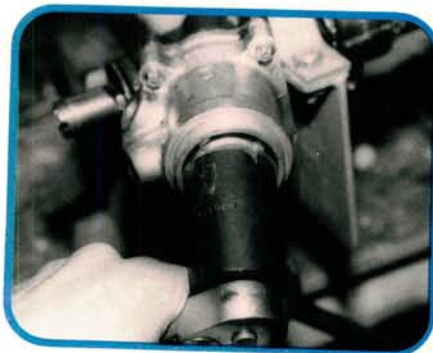
28

Install a new o-ring at the bottom of the rear housing. Coat the o-ring and the inner surface of the rear housing with ATF. Slide the rear housing into place over the pinion assembly. Carefully twist the housing until it bottoms. The rear housing fittings (arrow) face away from the cylinder.



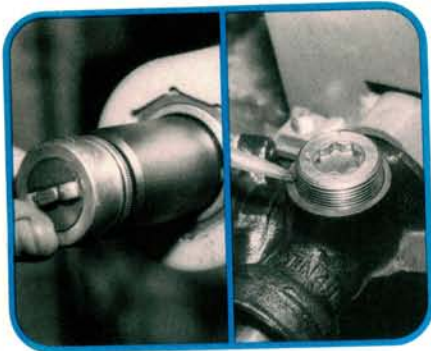
29

Torque the rear housing Torx® bolts evenly to 8-12 Nm. Reinstall the thrust washers and needle bearing in the order shown. You'll need another "suitable driver" to install a new rear housing cover seal. Replace the cover o-ring, coat it with ATF, then slide the housing cover over the taped shaft.



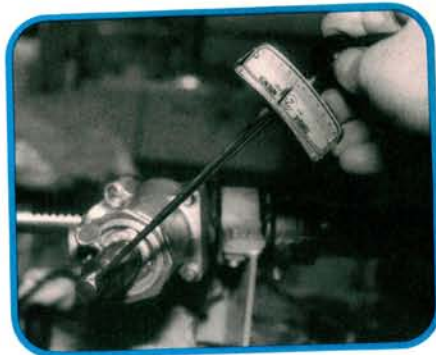
30

Hand tighten the rear housing cover. Then loosen it 45 degrees. Install the torque adapter, then turn the pinion shaft from lock to lock several times. Use an inch-pound torque wrench to measure the pinion starting torque. Adjust the rear housing cover until pinion starting torque is 7 in-lb.



31

Tighten the rear housing lock nut (left photo) to 78-137 Nm (58-101 ft-lb). Don't allow the adjusting screw to turn. Reinstall the retainer bushing and spring. Apply thread lock (right photo) to the retainer adjusting screw. Tighten the screw to 26 in-lb, then loosen the screw one eighth turn.



32

Pinion rotating force for the fully assembled rack should be less than 16 in-lb. This photo shows the pinion shaft torque adapter (arrow) and inch-pound torque wrench we mentioned in photo 30. Loosen or tighten the retainer adjusting screw to adjust rotating force. Torque the locknut to 39-59 Nm.



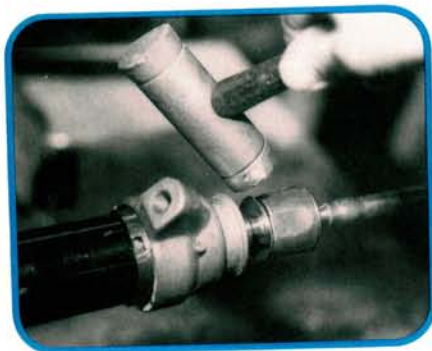
33

Center the rack shaft, using the measuring points shown in both photos. Rest your ruler against the shoulder inside the pinion housing (lower photo) for the pinion housing measurement. Rotate the pinion until both measurements equal 62 mm. Reinstall the plastic rear housing cap.



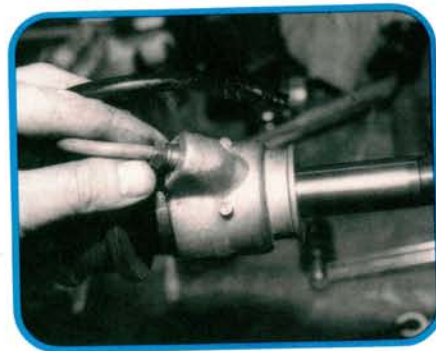
34

While you have the rack centered, punch a mark in the rear housing next to the cover pointer. Line up the punch mark and pointer when you reinstall the rack. Center the steering wheel, then slip the steering column joint over the pinion shaft. This saves a lot of time centering the steering wheel.



35

Install new lock plates on the inner tie rod ends. Apply thread lock to the inner tie rod threads, then install the tie rod ends. Make sure the teeth in the lock plates engage the slots in the rack. Torque the tie rod ends to 78-98 Nm (58-72 ft-lb). Flatten the lock plates over the rack shaft.



36

Turn the cylinder end housing as necessary to start the fitting, then reinstall the long cylinder line. Torque both line fittings to 20-26 Nm (14-20 ft-lb). Torque the cylinder lock nut to 78-108 Nm (58-101 ft-lb). Reinstall the dust boots, clamps, and breather hose.